

EXHIBIT A

WATER QUALITY MANAGEMENT PLAN

October 9, 2000

Preamble

Delta Wetlands Properties ("DW") proposed a water storage project on four islands in the Sacramento-San Joaquin Delta ("Delta"). The project would involve diverting and storing water on two of the islands (Bacon Island and Webb Tract, or "reservoir islands") and seasonally diverting water to create and enhance wetlands and to manage wildlife habitat on the other two islands (Bouldin Island and Holland Tract, or "habitat islands").

The purpose of the Delta Wetlands Project ("Project") is to divert surplus Delta inflows, transferred water or banked water for later sale and/or release for Delta export or to meet water quality or flow requirements for the Delta. To operate the Project, DW would strengthen the levees and install additional siphons and water pumps on the perimeters of the reservoir islands. The Project is undergoing environmental review (CEQA and NEPA), water rights permitting (State Water Resources Control Board), and an appraisal level study of the Project by the U.S. Bureau of Reclamation ("USBR").

California Urban Water Agencies¹ ("CUWA") and its member agencies have been participating in the public review of the Project since 1997 and are parties to the water rights proceedings for the Project. The primary focus of CUWA's participation in the review of the Project has been to seek a commitment from the Project proponents to minimize and mitigate drinking water quality impacts due to Project operations. Because of the close proximity of the reservoir islands to the Banks Pumping Plant, Tracy Pumping Plant, Contra Costa Canal at Pumping Plant #1, Contra Costa Water District's ("CCWD") Los Vaqueros intake on Old River and CCWD's Mallard Slough intake (hereafter "urban intakes"), CUWA is concerned that there is a potential for DW operations to result in increased total organic carbon ("TOC"), bromide, total dissolved solids ("TDS"), and chloride concentrations in urban water supplies.

In an effort to address CUWA's water quality concerns, Delta Wetlands Properties proposes to implement a water quality management plan ("WQMP"). The WQMP includes drinking water quality protection principles, an annual operating plan, general operating principles, a comprehensive monitoring program, screening procedures and operational constraints, and mitigation of water quality impacts. Collectively, the elements of the WQMP are intended to provide the urban water utilities with the necessary assurances that the Project will be operated in a manner that will ensure the protection of public health and long-term integrity of drinking water supplies diverted from the Sacramento-San Joaquin Delta.

The WQMP was developed through a negotiated process to resolve issues that are specific to the Project. The terms and conditions of the WQMP are intended to address the potential for injury to senior water rights holders associated with water quality degradation caused by the Project.

¹ All references to CUWA shall mean CUWA, its current member agencies and those member agencies of record as of the date of this agreement.

The impacts caused by the Project are unique because of its proximity to urban water agencies' intakes and the high rates of discharge from the reservoir islands. The Project, without the protections provided by the WQMP, has the potential to adversely impact human health by increasing disinfection by-products ("DBP") and to increase the overall cost of water utility operations. The Project could also lead to long-term degradation in drinking water quality. Because the WQMP includes distinctive features that are specific to DW, it should not be construed as setting a precedent that would be applicable to other dissimilar projects subject to State Water Resources Control Board jurisdiction.

A. Drinking Water Quality Protection Principles

The Project will adhere to the drinking water quality protection principles described below through the implementation of the terms and conditions of this WQMP.

1. Project operations shall cause no adverse health impacts to water users;
2. Project operations shall not cause nor contribute to non-compliance with current or future drinking water regulations;
3. Project operations shall cause no increases in the cost of water treatment or operations;
4. Project operations shall contribute to CALFED's progress toward achieving continuous improvement of Delta drinking water source quality; and
5. Project operations shall minimize and mitigate for any degradation in the quality of drinking water supplies.

B. Water Quality Management and Action Board and Annual Operating Plan

The Water Quality Management and Action Board and the Annual Operating Plan outlined below are intended to support the administration and implementation of the WQMP.

1. Prior to initiating or continuing Project operations, a Water Quality Management and Action Board ("WQMAB") shall be appointed to oversee the implementation of the WQMP for the Project subject to the procedures, duties and requirements set forth in Attachment 1.
2. Prior to February 15 of each year, DW will propose an Annual Operating Plan for approval by the WQMAB. The Annual Operating Plan will be updated monthly and coordinated with Central Valley Project, State Water Project, and CCWD operations. The Annual Operating Plan will include:
 - a. Schedules and estimated quantities for diversions to the Project islands and discharges from the Project islands.
 - b. Water quality goals and objectives, including the estimated concentration of TOC, bromide, chloride, and TDS for the diversions to the Project islands and discharges from the Project islands.

- c. An estimate of the projected change in the concentration of TOC, bromide, chloride, and TDS at the urban diversion locations due to scheduled Project operations.
- d. Maximum allowable concentrations of the water quality constituents of concern (TOC, bromide, TDS, and chloride) for water stored on the reservoir islands, above which it will be necessary for DW to pursue remedial actions pursuant to the Emergency Operating Plan. The maximum allowable concentrations are upper limits above which discharge of water from the reservoir islands may cause a violation of one or more of the drinking water quality protection principles.
- e. An Emergency Operating Plan describing remedial actions to be taken by DW in the event the water stored on the reservoir islands exceed the maximum allowable concentrations for the constituents of concern, including a procedure for discharge of the water from the reservoir islands that will minimize the potential for impacts to urban water utilities.
- f. A schedule for habitat island operations, including diversion and discharge rates.
- g. A schedule for reservoir island operations for non-storage periods.
- h. A description of the monitoring program, hydrodynamic models, and particle-tracking models pursuant to Section D.
- i. A description of mitigation measures to be implemented by DW to offset any long-term net increase in TOC, TDS, bromide or chloride loading pursuant to Section F.

C. General Operating Principles

The general operating principles outlined below are intended to support implementation of the WQMP.

- 1. To maintain low TOC, bromide and salinity levels to the fullest extent practicable, DW will:
 - a. Avoid practices that will result in high TOC productivity during non-storage periods;
 - b. Avoid diversions to storage during peak TOC periods;
 - c. Avoid diversions to storage during high bromide and high salinity periods; and
 - d. Manage vegetative growth on the reservoir islands to minimize TOC production.
- 2. To avoid degradation in water quality at the urban intakes in the Delta, DW will develop operational procedures to:
 - a. Reduce the rate of discharge from the reservoir islands as appropriate;

- b. Coordinate discharges between reservoir islands; and
 - c. Adjust discharges for exports in accordance with Delta hydrodynamic (e.g., tides, pulse flows).
3. To avoid excessive TOC, bromide and salinity levels, DW will:
 - a. Pursue remedial actions or acquire offsets before initiating further diversions to storage if TOC, bromide or salinity concentrations on reservoir islands regularly exceed 80% of the maximum allowable concentrations set forth in the Annual Operating Plan.

D. Comprehensive Monitoring Program

The comprehensive monitoring program outlined below will be developed and in place prior to initiating Project operations. The monitoring program provides for the collection of data to support the screening of Project operations and for imposition of operational constraints pursuant to Section E and the identification of mitigation requirements pursuant to Section F.

1. DW will conduct real-time water quality monitoring on the reservoir and habitat islands and in the Delta channels at the discharge locations of the reservoirs and habitat islands prior to and during all discharge periods.
2. The State Department of Water Resources ("DWR"), USBR and CCWD will provide real-time water quality monitoring data at urban intakes in the Delta.
3. The owners of urban water treatment facilities will provide water quality monitoring and operational data at water treatment plants.
4. The water quality monitoring program shall include quality assurance and quality control provisions.
5. Monitoring parameters will include TOC, bromide, TDS, chloride, UVA, DO, turbidity, and temperature.
6. DW will post monthly summaries of the data collected pursuant to subsections 1 through 3 above on the DW web site or adopt an alternative means of disseminating this information to the WQMAB and interested parties that provides an equivalent degree of accessibility.
7. Hydrodynamic and particle-tracking models will be used to predict both baseline conditions (without Project) and real-time changes at the urban intakes in the Delta prior to, during and after a Project operation. DW will submit a proposed monitoring and modeling program for approval by the WQMAB prior to operating the reservoir islands with annual updates and approvals of the modeling program thereafter (through the Annual Operating Plan review process) to reflect advances in science and technology.

Water quality constituent predictions required by the WQMP shall be calculated in accordance with the initial models and modeling assumptions set forth in Attachment 3, unless otherwise approved by the WQMAB.

E. Screening Procedures and Operational Constraints to Prevent Short-Term Impacts

The process outlined below for screening of Project operations and imposition of operational constraints is intended to prevent short-term impacts to urban water utilities and to ensure adherence to the drinking water quality protection principles 1 through 3 set forth in Section A.

1. Operational screening criteria will be used to identify Project operations that may threaten adherence to one or more of the drinking water quality protection principles. The operational screening criteria are set forth in Attachment 2 and implemented as described below.
2. Prior to DW initiating each diversion to the reservoir islands and each discharge from the reservoir islands and weekly thereafter during continuing diversions and discharges, the hydrodynamic and particle-tracking models will be used to predict whether Project operations (including operations of the habitat islands) are likely to exceed one or more of the operational screening criteria at the urban intakes in the Delta. (See Attachment 2, criteria A1, A2, B1, B2, C1, and C2.)
3. If the model output indicates that Project operations may exceed one or more of the operational screening criteria at one or more of the urban intakes in the Delta, DW will conduct further studies (prior to initiating a diversion to the reservoir islands or a discharge from the reservoir islands) to determine whether one or more of the drinking water quality protection principles would be threatened at an urban water treatment plant. (See Attachment 2, criteria A3, B3, and B4.)
4. If, upon further study, it appears that Project operations may threaten one or more of the drinking water protection principles at an urban water treatment plant, a determination will be made whether the threat would be offset by a Project-induced water quality or water supply improvement. If the owner of the impacted water treatment plant agrees that the threat would be offset or agrees to waive its right to protection under the WQMP, DW may initiate the diversion to the reservoir islands or discharge from the reservoir islands.
5. If Project operations threaten a drinking water quality protection principle at the water treatment plant without offsetting benefits and the treatment plant owner has not waived its right to protection, Project operations will be reduced, rescheduled or otherwise constrained as necessary to prevent the impact from occurring.
6. If an urban water treatment plant owner presents a complaint to DW and the WQMAB that: (1) a violation of a drinking water quality protection principle has occurred or is likely to occur in the absence of remedial action, or (2) one of the Project screening criteria set forth in Attachment 2 has been exceeded or is likely to be exceeded in the absence of remedial action, and (3) the WQMAB finds that the complaint has sufficient

merit to warrant an investigation; the WQMAB shall proceed with an investigation of the complaint. Throughout the duration of the WQMAB's investigation of the complaint and until the matter is resolved by the WQMAB, Project operations shall be restricted such that the maximum discharge rate from a reservoir island shall not exceed the schedule set forth in Table 1. Alternatively, the Project operations may proceed pursuant to the terms of an Emergency Operating Plan that has been approved by the WQMAB. DW shall cooperate with the WQMAB throughout the duration of the investigation.

7. If the WQMAB pursuant to the investigations set forth in paragraph E.6 make a finding that monitoring, modeling, and/or operational constraints fail to prevent a violation of a drinking water quality protection principle resulting from Project operations, or fail to prevent an exceedance of one of the operational screening criteria set forth in Attachment 2 due to Project operations, the WQMAB shall require DW to initiate emergency operations or take remedial actions to correct the problems.

Table 1¹

TOC Concentration on Bacon Island Minus That of Ambient Water (mg/L) ²	Maximum Discharge Rate from Bacon Island (cfs) ²	TOC Concentration on Webb Tract Minus That of Ambient Water (mg/L)	Maximum Discharge Rate from Webb Tract (cfs) ²	Chloride Concentration on a Reservoir Island (mg/L)	Maximum Combined Discharge Rate from Bacon Island and Webb Tract (cfs) ²
0 to 1.0	1,500	0 to 3.0	1,500	0 to 50	3,000
1.1 to 2.0	1,250	3.1 to 4.0	1,250	51 to 70	2,500
2.1 to 3.0	1,000	4.1 to 5.0	1,000	71 to 90	2,000
3.1 to 4.0	750	5.1 to 6.0	750	91 to 110	1,500
4.1 to 5.0	500	6.1 to 7.0	500	111 to 130	1,000
5.1 to 6.0	250	7.1 to 8.0	250	131 to 150	500
6.1 to 7.0	125	8.1 to 9.0	125	151 to 170	250
Greater than 7.0	40	Greater than 9.0	40	171 to 250	80

Table 1 footnotes:

- ¹ The restrictions on discharges from the reservoir islands contained in Table 1 for various concentrations of TOC and chloride are not applicable if the TOC and chloride concentrations on a reservoir island are less than or equal to the average TOC and chloride measured in the channels adjacent to the reservoir islands for the 7-day period prior to initiating the discharge.
- ² The maximum discharge rate means the average discharge rate over a 14-day period or the duration of the discharge, whichever time period is less. The maximum discharge rate shall be further constrained, as necessary, to limit the total contribution from the reservoir islands at the urban intakes to 25% of the combined export pumping at the Banks and Tracy pumping plants.

F. Mitigation of Long-Term Water Quality Impacts.

The process outlined below for mitigation of long-term water quality impacts due to Project operations is intended to prevent long-term impacts to urban water utilities and ensure adherence to the drinking water quality protection principles 3 and 4 set forth in Section A. Should Project operations produce a long-term net increase in TOC, TDS, bromide or chloride loading in the urban diversions, mitigation may be necessary, as described below:

1. During the course of the 12-month operating plan, DW shall maintain a running account of the changes in TOC, TDS, bromide and chloride in the water diverted from the Delta for urban use due to Project operations.
2. Once every three years, DW shall submit an accounting of the net increase or decrease in TOC, TDS, bromide and chloride loading in the water diverted from the Delta for urban use due to Project operations (including habitat island operations).
3. DW shall be required to acquire offsets or otherwise mitigate 150% of the net increase in TOC, TDS, bromide and chloride loading greater than 5% in the urban diversions due to Project operations.
4. DW must acquire the offsets or complete the mitigation at its expense within 24 months after the submission of the accounting set forth in 2 above. Any offset or mitigation that is provided in the current accounting period that is due to a mitigation requirement that accrued during a previous accounting period shall be excluded from the calculation of the net increase for the current accounting period.
5. In recognition of initial Project start-up, long-term mitigation requirements for TOC loading shall be waived for the first year of reservoir operation; however, the screening procedures and operational constraints to prevent short-term impacts set forth in Section E shall still apply.

ATTACHMENT 1

WATER QUALITY MANAGEMENT AND ACTION BOARD

1. **Purpose:** A Water Quality Management and Action Board ("WQMAB"), or an equivalent mutually acceptable authority, shall be appointed to oversee the implementation of the Water Quality Management Plan ("WQMP") for the Delta Wetlands Project ("Project").
2. **Members:**
 - a. **Qualifications:** The three members and three alternates shall be registered professional engineers, public health professionals or scientists possessing a thorough understanding of Delta operations and recognized for their expertise in organic and inorganic water chemistry and drinking water treatment.
 - b. **Appointment Process:** The State Water Resources Control Board ("SWRCB"), California Urban Water Agencies ("CUWA"), and Delta Wetlands Properties ("DW") shall each appoint one member and one alternate. Each prospective member of the WQMAB shall be required to disclose any past or current conflicts of interest that may affect their ability to serve as impartial members of the WQMAB. Appointment of prospective members with past or current conflicts of interest must be approved by the mutual consent of CUWA and DW. In the event that the SWRCB does not appoint its member or alternate to the WQMAB, CUWA and DW shall appoint the SWRCB's member or alternate member. Each of the WQMAB members shall be appointed for a term of four years. At the end of the 4-year term, the same selection process will be used to select the new WQMAB.
3. **Term:** The WQMAB shall be established prior to the first diversions to storage on Bacon Island or Webb Tract ("initial operations") and shall continue thereafter for the duration of Project reservoir operations.
4. **Compensation:** Members of the WQMAB are to be compensated by DW for their time on an hourly basis. Such costs, including costs of reports which may be prepared and studies which may be undertaken by the WQMAB shall be part of the annual operation and maintenance costs of the Project.
5. **Duties:**
 - a. The WQMAB shall serve as a neutral water quality advisory panel, hearing and investigating formally identified problems purportedly caused by Project reservoir operations, including but not limited to nonconformance with the Annual Operating Plan and violations of the Drinking Water Quality Protection Principles.
 - b. Prior to initial operations and annually thereafter, DW shall submit a proposed Annual Operating Plan for approval by the WQMAB pursuant to Section B of the WQMP.

- i. Prior to approving the Annual Operating Plan, the WQMAB shall provide an opportunity to comment on the draft Annual Operating Plan to the SWRCB, CUWA, and all other parties who have notified the WQMAB of their interest to comment on the draft Annual Operating Plan ("Interested Parties").
 - ii. In the event of any objection by CUWA or an Interested Party, the WQMAB may only approve the Annual Operating Plan after holding a noticed hearing on the proposed operating plan.
 - iii. If the WQMAB approves the Annual Operating Plan, the WQMAB shall immediately so advise DW.
 - iv. If the WQMAB does not approve an Annual Operating Plan, the WQMAB shall, within 10 days, provide a report explaining its decision to DW and to the Executive Director of the SWRCB. DW may provide a response to the WQMAB report to the Executive Director.
 - v. The issue of adequacy of the Annual Operating Plan will be decided by the Executive Director of the SWRCB as soon as possible upon receipt of such report.
 - vi. If the WQMAB does not approve the Annual Operating Plan for any reason, DW may continue its reservoir operations pursuant to the previously approved Annual Operating Plan or pursuant to paragraph E.6 of the WQMP, if applicable.
- c. DW shall make available water quality monitoring and modeling data to the WQMAB pursuant to Sections D and E of the WQMP.
 - d. During the first two years following initial operations, the WQMAB shall review water quality monitoring data at each stage of filling and discharge of the reservoir islands.
 - e. At the end of the third year of operations and every three years thereafter, DW shall submit to the WQMAB an accounting of the net increase or decrease in water quality parameters of concern in the water diverted from the Delta for urban use due to Project operations pursuant to Section F of the WQMP. Prior to initiating the fourth year of operations and each year thereafter, the Annual Operating Plan shall include a plan to offset or otherwise mitigate any net increase in water quality parameters of concern pursuant to Section F of the WQMP.
 - f. If the WQMAB determines that the Project operations are not in conformance with the Annual Operating Plan, the WQMAB shall require the permittee to initiate emergency operations or take remedial actions to correct problems as provided for in paragraph E.7 of the WQMP.
 - g. The terms of the WQMP may be adjusted over time by the SWRCB as set forth below. The SWRCB reserves jurisdiction over changes in the WQMP to coordinate or modify its terms for the protection of other legal users of water and the public interest as future

conditions may warrant. The SWRCB delegates authority to the Executive Director of the SWRCB to take actions under this reservation of jurisdiction as set forth below.

- i. During the third year of Project operations, the WQMAB shall review the WQMP to determine if changes in any of the WQMP terms are advisable. In its review, the WQMAB shall examine actual operation of the Project to date and any adverse effects of Project reservoir operations, including impacts to urban water agencies, degradation of drinking water quality, overall progress toward achieving continuous improvement of drinking water source quality, and any recent changes in state and federal drinking water regulations. The WQMAB will base each of its recommended changes to WQMP terms, if any, on its independent, professional judgment. At the conclusion of its review, the WQMAB shall issue a written list of its recommended changes, if any. The list shall be sent by the WQMAB to the SWRCB, DW, CUWA, and all other Interested Parties.
- ii. If no party raises a reasonable objection to a change recommended by the WQMAB within 30 days of service of any proposed change, then the Executive Director of the SWRCB may approve the change without the need for a comment period or hearing. In the event of any objection, the SWRCB may only approve the change after it provides notice of and an opportunity to comment on the proposed change. If requested by an DW, CUWA, or any Interested Party, the SWRCB may hold a hearing on the proposed change.
- h. After its initial 3-year review of the WQMP as set forth above, the WQMAB may thereafter periodically review and change the terms of the WQMP so long as the SWRCB review and approval process set forth above is followed.

ATTACHMENT 2

OPERATIONAL SCREENING CRITERIA

Operational Constraints

The operational screening criteria outlined in this attachment were developed to support the process outlined in Section E of the Water Quality Management Plan ("WQMP") for screening of Delta Wetlands Project ("Project") operations and imposition of operational constraints. This process is intended to support Delta Wetlands' ("DW") adherence to the drinking water quality protection principles 1 through 3 described in Section A of the WQMP.

These screening criteria are based on existing state and federal standards for disinfection by-products and their precursors. Should drinking water DBPs, contaminants or precursors, or any other drinking water contaminants be further regulated under state or federal law, the WQMAB shall recommend that the SWRCB amend the screening criteria to ensure that the intent of the drinking water quality protection principles continues to be met. -

Evaluation of Project operations using these screening criteria will be based on real-time field measurements and computer modeling results, both of which are subject to uncertainties. For purposes of determining whether the Project has caused an exceedance of one or more of the operational screen criteria, an uncertainty of $\pm 5\%$ of the screening criteria will be assumed.² Should greater precision in measurements and calculations be developed, the improved level of confidence will be used as appropriate for each individual parameter.

An exceedance of the operational screening criteria set forth in Sections A, B and C below shall be calculated as a 14-day average, or the average for duration of the discharge, whichever time period is less.

A. TOC Loading

The criteria below will be used in the screening procedures set forth in paragraphs E2 and E3 of the WQMP and in the imposition of operational constraints in paragraph E5 of the WQMP. The criteria are intended to prevent an impact due to Project-related TOC loading that may cause an increase in water treatment costs.

1. Project operations that cause an increase in TOC of more than 1.0 mg/L at the urban intakes; or
2. Project operations that cause TOC concentrations at the urban intakes to exceed 4.0 mg/L; and

² An uncertainty of $\pm 5\%$ shall mean that an exceedance of an operational screen criteria does not occur until the Project causes the following values to be exceeded: condition A.1 not applicable; conditions A.2 and A.3 = 0.2 mg/L TOC; conditions B.1 and B.3 = 3.2 $\mu\text{g/L}$ TTHM; conditions B.2 and B.4 = 0.4 $\mu\text{g/L}$ bromate; conditions C.1 and C.2 not applicable.

3. Project operations that cause TOC concentrations at a water treatment plant to exceed 4.0 mg/L.

B. DBP Formation

The criteria below will be used in the screening procedures set forth in paragraphs E.2 and E.3 of the WQMP and in the imposition of operational constraints in paragraph E.5 of the WQMP. The criteria are intended to prevent an impact due to Project-related DBP precursor loading that may cause health impacts to water users or may cause or contribute to a water treatment plant violation of a health regulation:

1. Project operations that cause or contribute to modeled Total Trihalomethanes ("TTHM") concentrations in drinking water in excess of 64 µg/L, as calculated in the raw water of an urban intake in the Delta;
2. Project operations that cause or contribute to modeled bromate concentrations in drinking water in excess of 8 µg/L, as calculated in the raw water of an urban intake in the Delta;
3. Project operations that cause or contribute to predicted TTHM concentrations in drinking water in excess of 64 µg/L, as calculated from measurements at the outlet of a water treatment plant; or
4. Project operations that cause or contribute to predicted bromate concentrations in drinking water in excess of 8 µg/L, as calculated from measurements at the outlet of a water treatment plant.

C. Salinity Impacts Resulting from Project Operations

The criteria below will be used in the screening procedures set forth in paragraphs E.2 and E.3 of the WQMP and in the imposition of operational constraints in paragraph E.5 of the WQMP. The criteria are intended to promote Project operations that select the highest water quality for diversion to the islands and minimize salinity impacts associated with discharges from the reservoir islands:

1. Project operations that cause an increase in salinity of more than 10 mg/L chloride at one or more of the urban intakes; or
2. Project operations that cause or contribute any salinity increase at the urban intakes in the Delta exceeding 90% of an adopted salinity standard (e.g., Rock Slough chloride standard defined in SWRCB Decision 1641).

ATTACHMENT 3 INITIAL MODELING ASSUMPTIONS

The screening procedures and long-term mitigation requirements of the Water Quality Management Plan ("WQMP") require several analytical tools to predict water quality and disinfection by-products ("DBP") changes or Total Trihalomethanes ("TTHM"). Three models will be required to implement the WQMP: 1) a water quality model, 2) a particle-tracking model, and 3) a water treatment model for DBPs. The Annual Operating Plan sets forth periodic update and approval requirements of the final modeling program; however, the initial modeling assumptions included in the evaluations for the WQMP have been included below:

1. Initial modeling assumptions

- a. Baseline hydrology: existing conditions and short-term forecasts (50% exceedence) of future conditions
- b. Baseline water quality: Fischer Delta Model Version 10 with real tide simulations

2. Initial land use assumptions

- a. No-Project irrigation and drainage quantities: DWR DICU historic rates
- b. No-Project agricultural drainage quality:
 - i. Ag bromide to channel bromide ratio (Ag/Ch Ratio) = $\max(65.597 * Ch^{-0.6436} \text{ or } 125\%)$
 - ii. Ag TOC = Average of west and south Delta MWD assumptions

3. TTHM Model (Malcolm Pirnie)

$$TTHM = 7.21 \times TOC^{0.004} \times UVA_{254}^{0.534} \times (Cl_{DOSE} - 7.6 \times NH_3N)^{0.224} \times Cl_{TIME}^{0.255} \times (Br+1)^{2.01} \times (pH-2.6)^{0.719} \times T^{-0.48}$$

Where:

TOC = raw water TOC (mg/l) x (0.75 if TOC < 4 or 0.65 if TOC > 4)

$UVA_{254} = 0.033 \times TOC + 0.010$

Cl_{DOSE} (Cl:TOC ratio) = 1.0

NH_3N = Not Applicable

Cl_{TIME} (contact time) = 1.0 hour

Br = raw water bromide (mg/l)

pH = 7.0

T = Monthly average raw water temperature (9-24°C)

4. Bromate Model (Ozekin)

$$\text{BRM} = [1.63 \text{ E-}06 \times \text{TOC}^{-1.26} \times \text{pH}^{5.82} \times \text{O3}_{\text{DOSE}}^{1.57} \times \text{Br}^{0.73} \times \text{O3}_{\text{TIME}}^{0.28}] \times \text{BRMCF}$$

Where:

TOC = raw water TOC (mg/l) x (0.75 if TOC < 4 or 0.65 if TOC > 4)

pH = 7.0

O3_{DOSE} (O3:TOC ratio) = 0.6

Br = raw water bromide (µg/l)

O3_{TIME} (contact time) = 12 minutes

BRMCF (bromate correction factor) = 0.56